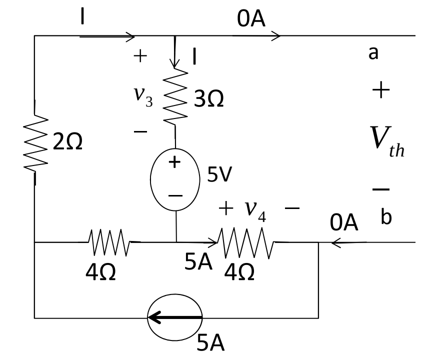
Practice 1: Find R_{th}, V_{th} for the two terminal circuit



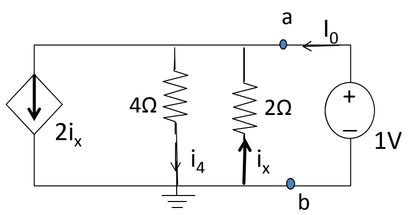
$R_{th} = 4 + 3//(2+4) = 6\Omega$

$V_{th} = v_3 + 5 + v_4 = 3I + 5 + 4\times 5$

To find I, use mesh analysis

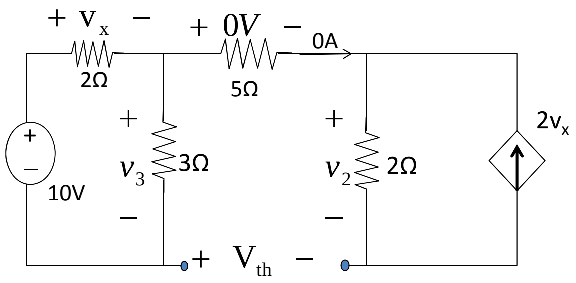
$3I+5+4(I-5)+2I=0$
$9I=15$, $I=5/3$
$V_{th}=3\times 5/3+25=30V$

Practice 2: Find R_{th}, V_{th} for the two terminal circuit



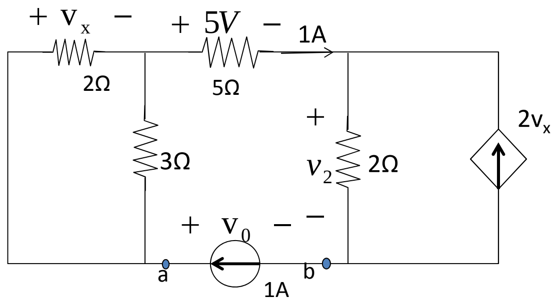
No independent source.
$V_{th}=0$.
To find R_{th}, supply 1V.
$i_x=-1/2A$, $i_4=1/4$
$I_0=i_4+2I_x-I_x=1/4-1/2=-1/4A$
$R_{th}=1/I_0=-4\Omega$
Negative resistance due to dep source.

Practice 3: Find R_{th}, V_{th} for the two terminal circuit



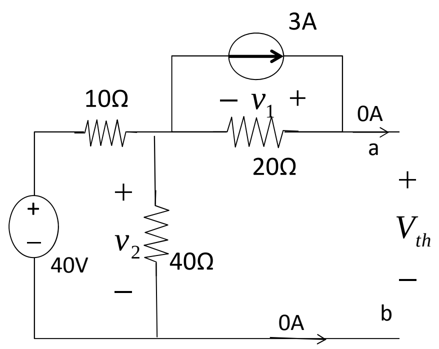
$V_{th}= v_2-v_3.$
By voltage division,
$v_3=(3/5)\times 10=6V$;
$v_x=4V$
By Ohms low, $v_2=2\times 2v_x=16V$;
$V_{th}=16-6=10V$

For R_{th}, supply 1A



$v_x=1\times(2//3)=1.2V$,
$v_2=2(2v_x+1)=6.8V$
$v_0= v_x+5+v_2=13V$,
$R_{th}=v_0/1=13\Omega$

Practice 4: Find the Norton's equivalent



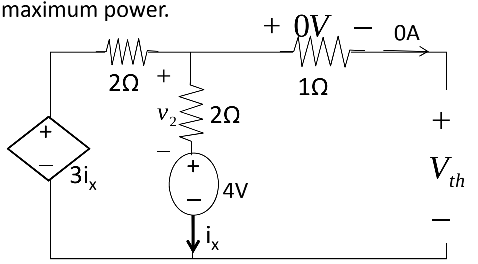
$R_N=20+40//10=28\Omega$

It is easier to find V_{th}, then $I_N=V_{th}/R_N$

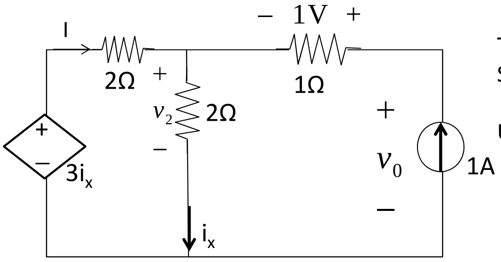
$V_{th}=v_1+v_2$

$v_1=20\times 3=60V$
Same current in 10Ω and 40Ω.
By voltage division,
$v_2= (40/50)\times 40=32V$
$V_{th}=v_1+v_2= 92V$;
$I_N=92/28=23/7\Omega$

Practice 5: Find the value of R_L so that maximum power is delivered. Also find the maximum power.



V_{th}= v_2+4
To find v_2, use mesh analysis.
$2i_x+2i_x+4-3i_x=0$
$i_x=-4A$
$V_{th}=2i_x+4=-4V$

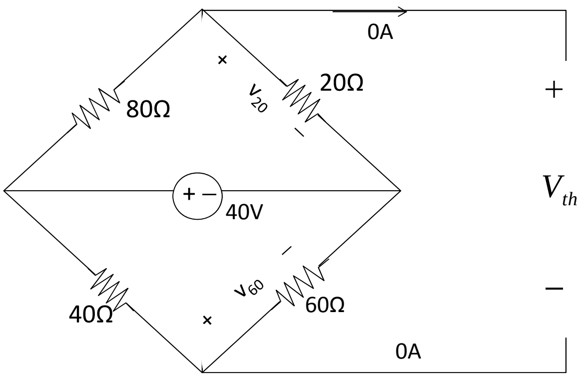


To find R_{th}, turn off 4V,
Supply 1A, $R_{th}= v_0/1$
$v_0=1+v_2$.
Use mesh analysis to find v_2

Assign current I. Then i_x=I+1
By KVL along left mesh:
2I+2(I+1)-3(I+1)=0;
I=1A; i_x=2A
$v_2=2i_x$=4V, v_0=1+4=5V
R_{th}=5Ω;

The maximum power is delivered when R=5Ω. The maximum power is $p_{max}=V_{th}^2/(4R_{th})$=16/20=0.8W

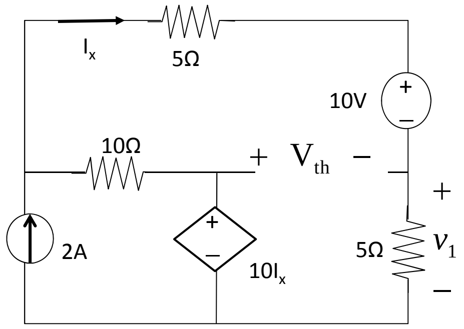
Practice 6: Find the unknown R_L so that maximum power is delivered. Also find the maximum power.



V_{th}= v_{20}-v_{60} . By voltage division, v_{20}=(20/100)×40=8V, v_{60}=(60/100)×40=24V
V_{th}= 8-24=-16V
For R_{th}, turn off 40V with short circuit. Then R_{th}=20//80+40//60=16+24=40Ω
The maximum power is delivered when $R_L = R_{th} = 40Ω$,

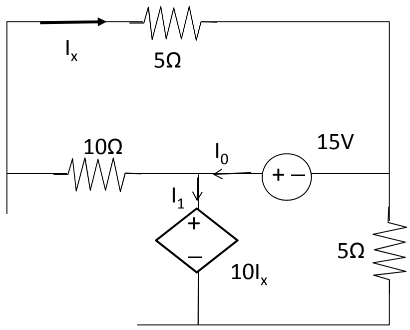
$$p_{\max} = \frac{(-16)(-16)}{4\times 40} = 1.6W$$

Practice 7: Find the unknown R so that maximum power is delivered. Also find the maximum power.



$V_{th}=10I_x-v_1=10I_x-5I_x=5I_x$. Use mesh analysis to find I_x.
By KVL, $5I_x+10+5I_x-10I_x+10(I_x-2)=0$, $I_x=1A$;
$V_{th}=5I_x=5V$.

To find R_{th}, turn off 2A,10V and supply $v_0=15V$. Then $R_{th}=15/I_0$



$I_x=15/(10+5)=1A$;
$I_1=(15-10I_x)/5=1A$
$I_0=I_1+I_x=2A$
$R_{th}=15/2=7.5Ω$

The maximum power is delivered when $R=7.5Ω$;
$p_{max}=5^2/(4\times7.5)=5/6W$